

We claim:

1. A method by a remote unit in a radio communication system which employs Orthogonal Frequency Division Multiplexing, the remote unit receiving received symbols from a base station, each symbol including at least one packet, each packet including an address and a payload, the method comprising the steps of:

determining whether a received symbol is a retransmitted symbol;

10 if the received symbol is a retransmitted symbol and a stored symbol corresponding to the received symbol is stored at the remote unit, performing soft-combining of the received symbol and the stored symbol;

determining whether the address of each packet corresponding to the received symbol can be determined reliably;

15 if the address of a packet can be determined reliably, the further steps of:

determining the address of the packet;

20 determining whether the address of the packet indicates that the remote unit is an intended recipient of the packet; and

if the remote unit is an intended recipient of the packet, the further steps of:

25 determining whether there is an error in the payload of the packet; and

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if there is an error in the payload of the packet,  
the further steps of:

signalling to the base station that the packet is  
to be retransmitted; and

5 storing the received symbol in a buffer.

2. The method of claim 1 wherein each received symbol  
includes a retransmission indicator bit, and the step of  
determining whether a received symbol is a retransmitted  
symbol examines the retransmission indicator bit.

10 3. The method of claim 1 wherein the step of  
signalling to the base station that the packet is to be  
retransmitted includes transmitting a retransmission request,  
the retransmission request including a packet identifier and  
a symbol identifier.

15 4. The method of claim 1 wherein the radio  
communication system employs coded Orthogonal Frequency  
Division Multiplexing, and the method further comprising the  
steps of:

20 determining whether the received symbol can be  
successfully decoded; and

if the received symbol can not be successfully  
decoded, storing the received symbol in the buffer.

5. A remote unit for a radio communication system  
which employs Orthogonal Frequency Division Multiplexing, the  
25 remote unit receiving received symbols from a base station,  
each symbol including at least one packet, each packet  
including an address and a payload, the remote unit  
comprising:

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a symbol buffer for storing at least one stored
symbol;

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a symbol decoder coupled to the symbol buffer and operating to:

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5           determine whether a received symbol is a
           retransmitted symbol;
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determine whether a stored symbol corresponding to the received symbol is stored within the symbol buffer; and

perform soft-combining of the received symbol and  
10 the stored symbol corresponding to the received symbol in the  
event that the received symbol is a retransmitted symbol and  
that a stored symbol corresponding to the received symbol is  
stored within the symbol buffer;

15 a retransmission request processor coupled to the  
symbol decoder so as to receive a symbol from the symbol  
decoder, coupled to the symbol buffer, and operating to:

determine whether the address of each packet corresponding to the symbol received from the symbol decoder can be determined reliably;

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20         determine the address of a packet in the event that
the address of the packet can be determined reliably;

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determine whether the address of a packet indicates that the remote unit is an intended recipient of the packet in the event that the address of the packet can be determined reliably;

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    determine whether there is an error in the payload
of a packet;

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place the symbol in the symbol buffer in the event that the address of the packet can be determined reliably, that the address of the packet indicates that the remote unit is an intended recipient of the packet, and that there is an error in the payload of the packet; and

prepare a retransmission request for transmission to the base station in the event that the address of the packet can be determined reliably, that the address of the packet indicates that the remote unit is an intended recipient of the packet, and that there is an error in the payload of the packet.

6. The remote unit of claim 5 wherein each received symbol includes a retransmission indicator bit, and the symbol decoder determines whether a received symbol is a retransmitted symbol by examining the retransmission indicator bit.

7. The remote unit of claim 5 wherein the retransmission request processor prepares a retransmission request so as to include a packet identifier and a symbol identifier.

8. The remote unit of claim 5 wherein the radio communication system employs coded Orthogonal Frequency Division Multiplexing, and wherein the symbol decoder further operates to:

decode the received symbol; and

store the received symbol in the symbol buffer in the event that the received symbol can not be decoded successfully.

9. A remote unit for a radio communication system which employs Orthogonal Frequency Division Multiplexing, the remote unit receiving received symbols from a base station, each symbol including at least one packet, each packet including an address and a payload, the remote unit comprising:

a buffer for storing at least one stored symbol;

means for determining whether a received symbol is a retransmitted symbol;

means for performing soft-combining of the received symbol and a stored symbol in the event that the received symbol is a retransmitted symbol and that a stored symbol corresponding to the received symbol is stored within the buffer;

means for determining whether the address of each packet corresponding to the received symbol can be determined reliably;

means for determining the address of a packet;

means for determining whether the address of a packet indicates that the remote unit is an intended recipient of the packet;

means for determining whether there is an error in the payload of a packet;

means for signalling to the base station that a packet is to be retransmitted in the event that the address of the packet can be determined reliably, that the address of the packet indicates that the remote unit is an intended recipient of the packet, and that there is an error in the payload of the packet; and

means for storing the received symbol in the buffer in the event that the address of the packet can be determined reliably, that the address of the packet indicates that the remote unit is an intended recipient of the packet, and that there is an error in the payload of the packet.

10. The remote unit of claim 9 wherein each received symbol includes a retransmission indicator bit, and the means for determining whether a received symbol is a retransmitted symbol comprise means for examining the retransmission indicator bit.

11. The remote unit of claim 9 wherein the means for signalling to the base station that a packet is to be retransmitted include means for transmitting a retransmission request, the retransmission request including a packet identifier and a symbol identifier.

12. The remote unit of claim 9 wherein the radio communication system employs coded Orthogonal Frequency Division Multiplexing, and wherein the remote unit further comprises means for storing the received symbol in the buffer in the event that the received symbol can not be decoded successfully.

13. A processor in a remote unit for a radio communication system which employs Orthogonal Frequency Division Multiplexing, the remote unit receiving received symbols, the processor including instructions for:

determining whether a received symbol is a retransmitted symbol;

determining whether a stored symbol corresponding to the received symbol is stored at the remote unit; and

performing soft-combining of the received symbol and the stored symbol in the event that a stored symbol corresponding to the received symbol is stored at the remote unit.

5 14. The processor of claim 13 wherein each received symbol includes a retransmission indicator bit, and the instructions for determining whether a received symbol is a retransmitted symbol include instructions for examining the retransmission indicator bit.

10 15. A processor in a remote unit for a radio communication system which employs Orthogonal Frequency Division Multiplexing, the processor receiving symbols as input, each symbol including at least one packet, each packet including an address and a payload, the processor including  
15 instructions for:

determining whether the address of a packet can be determined reliably;

determining the address of a packet, in the event that the address of the packet can be determined reliably;

20 determining whether the address of a packet indicates that the remote unit is an intended recipient of the packet;

determining whether there is an error in the payload of a packet;

25 signalling to a transmission encoder that a packet is to be retransmitted in the event that the address of the packet can be determined reliably, that the address of the packet indicates that the remote unit is an intended

recipient of the packet, and that there is an error in the payload of the packet; and

storing the symbol to which a packet corresponds in a buffer in the event that the address of the packet can be determined reliably, that the address of the packet indicates that the remote unit is an intended recipient of the packet, and that there is an error in the payload of the packet.

16. A method by a base station in a radio communication system which employs Orthogonal Frequency Division Multiplexing, the base station transmitting at least one symbol, each symbol including at least one packet, the method comprising the steps of:

receiving a retransmission request, the retransmission request including a packet identifier and a symbol identifier;

determining whether the retransmission request is for a packet or for a symbol;

if the retransmission request is for a packet, and if the packet identified by the packet identifier is available as a stored packet, retransmitting the packet;

if the retransmission request is for a symbol, if the symbol identified by the symbol identifier is available as a stored symbol, and if there are other pending retransmission requests for the symbol, retransmitting the symbol;

if the retransmission request is for a symbol, if the symbol identified by the symbol identifier is available as a stored symbol, and if the packet identified by the



packet identifier has a size larger than a threshold,  
retransmitting the symbol; and

if the retransmission request is for a symbol, if  
the packet identified by the packet identifier is available  
5 as a stored packet, and if the packet identified by the  
packet identifier has a size not larger than the threshold,  
retransmitting the packet.

17. The method of claim 16 wherein the step of  
determining whether the retransmission request is for a  
10 packet or for a symbol comprises the steps of:

determining whether the retransmission request  
originated from a remote unit, or from an upper layer  
protocol within the communication system;

determining that the retransmission request is for  
15 a symbol if the retransmission request originated from a  
remote unit; and

determining that the retransmission request is for  
a packet if the retransmission request originated from an  
upper layer protocol within the communication system.

18. A base station for a radio communication system  
which employs Orthogonal Frequency Division Multiplexing, the  
base station transmitting at least one symbol, each symbol  
including at least one packet, the base station comprising:

means for receiving a retransmission request, the  
25 retransmission request including a symbol identifier and a  
packet identifier;

a retransmission processor coupled to a buffer  
unit, coupled to a transmission encoder, coupled to a  
transmitter symbol selector, and operating to:

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determine whether the retransmission request is for a packet or for a symbol;

retrieve from the buffer unit a packet identified by the packet identifier and pass the retrieved packet to the transmission encoder in the event that:

the retransmission request is for a packet and the packet identified by the packet identifier is available in the buffer unit; or

the retransmission request is for a symbol, the packet identified by the packet identifier is available in the buffer unit, and the packet identified by the packet identifier has a size not larger than a threshold; and

retrieve from the buffer unit a symbol identified by the symbol identifier and pass the retrieved symbol to the transmitter symbol selector in the event that:

the retransmission request is for a symbol, a symbol identified by the symbol identifier is available in the buffer unit, and there are other pending retransmission requests for the symbol; or

the retransmission request is for a symbol, a symbol identified by the symbol identifier is available in the buffer unit, and the packet identified by the packet identifier has a size larger than a threshold.

19. The base station of claim 18 wherein each transmitted symbol includes a retransmission indicator bit whose value depends on whether the symbol is an original symbol or a retransmitted symbol.

20. The base station of claim 18 wherein each transmitted symbol includes a symbol serial number, and the

base station further comprising a symbol numbering processor for generating a symbol serial number based on timing information.

21. The base station of claim 18 wherein the retransmission processor determines that the retransmission request is for a symbol in the event that the retransmission request originated from a remote unit, and determines that the retransmission request is for a packet in the event that the retransmission request originated from an upper layer protocol within the communication system.

22. A base station for a radio communication system which employs Orthogonal Frequency Division Multiplexing, the base station transmitting at least one symbol, each symbol including at least one packet, the base station comprising:

means for receiving a retransmission request, the retransmission request including a symbol identifier and a packet identifier;

means for determining whether the retransmission request is for a packet or for a symbol;

means for retransmitting a packet in the event that:

the retransmission request is for a packet and the packet identified by the packet identifier is available as a stored packet; or

the retransmission request is for a symbol, the packet identified by the packet identifier is available as a stored packet, and the packet identified by the packet identifier has a size not larger than a threshold; and

means for retransmitting a symbol in the event that the retransmission request is for a symbol, that the symbol identified by the symbol identifier is available as a stored symbol, and that:

5           there are other pending retransmission requests for  
the symbol; or

the packet identified by the packet identifier has a size larger than a threshold.

23. The base station of claim 22 wherein each  
10 transmitted symbol includes a retransmission indicator bit  
whose value depends on whether the symbol is an original  
symbol or a retransmitted symbol.

24. The base station of claim 22 wherein each transmitted symbol includes a symbol serial number, and the base station further comprising means for generating a symbol serial number based on timing information.

25. The base station of claim 22 wherein the means for determining whether the retransmission request is for a packet or for a symbol comprise:

20 means for determining whether the retransmission  
request originated from a remote unit, or from an upper layer  
protocol within the communication system;

means for determining that the retransmission  
request is for a symbol in the event that the retransmission  
25 request originated from a remote unit; and

means for determining that the retransmission request is for a packet in the event that the retransmission request originated from an upper layer protocol within the communication system.

26. A processor in a base station for a radio communication system which employs Orthogonal Frequency Division Multiplexing, the processor receiving as input a retransmission request, the retransmission request including a symbol identifier and a packet identifier, the processor including instructions for:

determining whether the retransmission request is for a packet or for a symbol;

retrieving a stored packet and passing the stored packet to a transmission encoder, in the event that:

the retransmission request is for a packet and the packet identified by the packet identifier is available as a stored packet; or

the retransmission request is for a symbol, the packet identified by the packet identifier is available as a stored packet, and the packet identified by the packet identifier has a size not larger than a threshold; and

retrieving a stored symbol and passing the stored symbol to a transmission encoder, in the event that the retransmission request is for a symbol, that the symbol identified by the symbol identifier is available as a stored symbol, and that:

there are other pending retransmission requests for the symbol; or

the packet identified by the packet identifier has a size larger than a threshold.

27. The processor of claim 26 wherein the instructions for determining whether the retransmission request is for a packet or for a symbol include instructions for:

determining whether the retransmission request originated from a remote unit, or from an upper layer protocol within the communication system;

determining that the retransmission request is for  
5 a symbol in the event that the retransmission request  
originated from a remote unit; and

determining that the retransmission request is for  
a packet in the event that the retransmission request  
originated from an upper layer protocol within the  
communication system.

28. A processor in a base station for a radio communication system which employs Orthogonal Frequency Division Multiplexing, the processor including instructions for:

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15         generating a symbol serial number from timing
        information; and

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encoding a symbol from at least one packet, a retransmission indicator bit, and the symbol serial number.

29. A method in a radio communication system which  
20 employs Orthogonal Frequency Division Multiplexing, the radio  
communication system comprising a base station and at least  
one remote unit, each remote unit receiving received symbols  
from a base station, each symbol including at least one  
packet, each packet including an address and a payload, the  
25 method comprising the steps of:

at a remote unit, determining whether a received symbol is a retransmitted symbol;

if the received symbol is a retransmitted symbol  
and a stored symbol corresponding to the received symbol is

stored at the remote unit, performing soft-combining of the received symbol and the stored symbol at the remote unit;

determining whether the address of each packet corresponding to the received symbol can be determined reliably at the remote unit;

if the address of a packet can be determined reliably, the further steps of:

determining the address of the packet at the remote unit;

determining whether the address of the packet indicates that the remote unit is an intended recipient of the packet; and

if the address of a packet indicates that the remote unit is an intended recipient of the packet, the further steps of:

determining whether there is an error in the payload of the packet at the remote unit; and

if there is an error in the payload of the packet, the further steps of:

signalling to the base station that the packet is to be retransmitted; and

storing the received symbol in a buffer at the remote unit;

receiving a retransmission request at the base station, the retransmission request including a symbol identifier and a packet identifier;

at the base station, determining whether the retransmission request is for a packet or for a symbol;

if the retransmission request is for a packet, and if the packet identified by the packet identifier is available as a stored packet, the base station retransmitting the packet;

if the retransmission request is for a symbol, if the symbol identified by the symbol identifier is available as a stored symbol, and if there are other pending retransmission requests for the symbol, the base station retransmitting the symbol;

if the retransmission request is for a symbol, if the symbol identified by the symbol identifier is available as a stored symbol, and if the packet identified by the packet identifier has a size larger than a threshold, the base station retransmitting the symbol; and

if the retransmission request is for a symbol, if the packet identified by the packet identifier is available as a stored packet, and if the packet identified by the packet identifier has a size not larger than the threshold, the base station retransmitting the packet.